United Nations

Framework Convention on Climate Change

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Report on the individual review of the annual submission of Sweden submitted in 2017*

Note by the expert review team

Summary

Each Party included in Annex I to the Convention must submit an annual greenhouse gas (GHG) inventory covering emissions and removals of GHG emissions for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2017 annual submission of Sweden, conducted by an expert review team in accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol". The review took place from 18 to 23 September 2017 in Bonn, Germany.

* In the symbol for this document, 2017 refers to the year in which the inventory was submitted, not to the year of publication.

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Contents

		Paragraphs	*Page*
	Abbreviations and acronyms		3
I.	Introduction	1–5	5
II.	Summary and general assessment of the 2017 annual submission	6	6
III.	Status of implementation of issues and/or problems raised in the previous review report	7	8
IV.	Issues identified in three successive reviews and not addressed by the Party	8	15
V.	Additional findings made during the 2017 individual inventory review	9	15
VI.	Application of adjustments	10	31
VII.	Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol	11	31
VIII.	Questions of implementation	12	31
Annexes			
I.	Overview of greenhouse gas emissions and removals for Sweden for submission year 2017 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Sweden		32
II.	Information to be included in the compilation and accounting database		36
III.	Additional information to support findings in table 2		38
IV.	Documents and information used during the review		39

Abbreviations and acronyms

2006 IPCC Guidelines	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
AAU	assigned amount unit
AD	activity data
Annex A sources	source categories included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	"Guidelines for review under Article 8 of the Kyoto Protocol"
CEF	carbon emission factor
CER	certified emission reduction
CH_4	Methane
CM	cropland management
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CPR	commitment period reserve
CRF	common reporting format
EF	emission factor
ERT	expert review team
ERU	emission reduction unit
EU ETS	European Union Emissions Trading System
FAO	Food and Agriculture Organization of the United Nations
F-gas	fluorinated gas
FM	forest management
FMRL	forest management reference level
$Frac_{GASF}$	fraction of total nitrogen fertilizer emitted as nitrogen oxides and ammonia
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood product
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPPU	industrial processes and product use
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LPG	liquefied petroleum gas
LULUCF	land use, land-use change and forestry
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NCV	net calorific value
NE	not estimated
NF_3	nitrogen trifluoride
NFM	non-ferrous metals
NIR	national inventory report
NK	nitrogen potassium fertilizer

NMVOC	non-methane volatile organic compound
NO	not occurring
NPK	nitrogen phosphorous potassium fertilizer
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF_6	sulfur hexafluoride
TJ	terajoule
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC Annex I inventory reporting guidelines	"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories"
UNFCCC review guidelines	"Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention"
WDR	wetland drainage and rewetting
Wetlands Supplement	*2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*

I. Introduction[1]

1. This report covers the review of the 2017 annual submission of Sweden organized by the secretariat, in accordance with the Article 8 review guidelines (decision 22/CMP.1, as revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention" (decision 13/CP.20). The review took place from 18 to 23 September 2017 in Bonn, Germany, and was coordinated by Ms. Veronica Colerio, Mr. Roman Payo and Mr. Davor Vesligaj (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Sweden.

Table 1
Composition of the expert review team that conducted the review of Sweden

Area of expertise	*Name*	*Party*
Generalist	Ms. Elena Gavrilova	The former Yugoslav Republic of Macedonia
	Ms. Kristina Saarinen	Finland
Energy	Ms. Veronica Ginzburg	Russian Federation
	Mr. Giorgi Mukhigulishvili	Georgia
	Mr. Dingane Sithole	Zimbabwe
	Mr. Hongwei Yang	China
IPPU	Ms. Emma Salisbury	United Kingdom of Great Britain and Northern Ireland
	Mr. Koen Smekens	Belgium
	Mr. David Glen Thistlethwaite	United Kingdom
Agriculture	Ms. Laura Cardenas	United Kingdom
	Ms. Yue Li	China
	Mr. Asaye Ketema Sekie	Ethiopia
LULUCF	Mr. Craig William Elvidge	New Zealand
	Mr. Agustín José Inthamoussu	Uruguay
	Ms. Thelma Krug	Brazil
	Mr. Harry Vreuls	Netherlands
Waste	Mr. Cristobal Felix Diaz Morejon	Cuba
	Mr. Pavel Gavrilita	Republic of Moldova
	Mr. Igor Ristovski	The former Yugoslav Republic of Macedonia
Lead reviewers	Ms. Gavrilova	
	Ms. Saarinen	

2. The basis of the findings in this report is based on the assessment by the ERT of the consistency of the Party's 2017 annual submission with the Article 8 review guidelines.

[1] At the time of publication of this report, Sweden had submitted its instrument of ratification of the Doha Amendment, however, the amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, paragraph 6, pending the entry into force of the amendment.

The ERT has made recommendations that Sweden resolve the findings related to issues,[2] including issues designated as problems.[3] Other findings, and, if applicable, the encouragements of the ERT to Sweden to resolve them, are also included.

3. A draft version of this report was communicated to the Government of Sweden, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.

4. Annex I shows annual GHG emissions for Sweden, including totals excluding and including the LULUCF sector, indirect CO_2 emissions and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected, by gas, sector and activity for Sweden.

5. Information to be included in the compilation and accounting database can be found in annex II.

II. Summary and general assessment of the 2017 annual submission

6. Table 2 provides the assessment by the ERT of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2
Summary of review results and general assessment of the inventory of Sweden

Assessment			*Issue or problem ID[a](s) in table 3 and/or 5[a]*
Dates of submission	Original submission: 12 April 2017 (NIR), 12 April 2017, Version 2 (CRF tables), 12 April 2017 (SEF-CP2-2016), 17 May 2017 (SEF-CP1-2016)		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	1. Have any issues been identified in the following areas:		
	(a) Identification of key categories	No	
	(b) Selection and use of methodologies and assumptions	No	
	(c) Development and selection of EFs	Yes	I.8, I.20, L.4
	(d) Collection and selection of AD	Yes	I.14, I.17, L.7
	(e) Reporting of recalculations	No	
	(f) Reporting of a consistent time series	No	
	(g) Reporting of uncertainties, including methodologies	No	
	(h) QA/QC procedures were assessed in the context of the national system (see para. 2 in this table)	No	
	(i) Missing categories/completeness[b]	Yes	L.3
	(j) Application of corrections to the inventory	No	

[2] Issues are defined in decision 13/CP.20, annex, paragraph 81.

[3] Problems are defined in decision 22/CMP.1, annex, paragraphs 68 and 69, as revised by decision 4/CMP.11.

Assessment			*Issue or problem ID #(s) in table 3 and or 5[a]*
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	The Party did not report "NE" for any insignificant categories	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	Yes	
Supplementary information under the Kyoto Protocol	2. Have any issues been identified related to the national system:		
	(a) The overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements	No	
	(b) Performance of the national system functions	No	
	3. Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange	No	
	4. Have any issues been identified related to reporting of information on ERUs, CERs, AAUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	5. Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, including any changes since the previous annual submission?	No	
	6. Have any issues been identified related to the reporting of LULUCF activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as follows:		
	(a) Reporting requirements in decision 2/CMP.8, annex II, paragraphs 1–5	Yes	KL.3
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14	No	
	(c) Reporting requirements of decision 6/CMP.9	No	
	(d) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34	No	
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	

Assessment			*Issue or problem ID #(s) in table 3 and/or 5[a]*
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	The Party does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	
Questions of implementation	Did the ERT list a question of implementation?	No	

[a] The ERT identified additional issues and/or problems in all sectors and for KP-LULUCF activities that are not listed in this table but are included in table 3 and/or 5.

[b] Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

III. Status of implementation of issues and/or problems raised in the previous review report

7. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 6 April 2017.[4] For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2017 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3
Status of implementation of issues and/or problems raised in the previous review report of Sweden

ID#	*Issue and/or problem classification[a]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
General			
G.1	QA/QC and verification (G.1, 2016) (G.1, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Strengthen the QA/QC process to ensure that all cross-sectoral tables contain up-to-date information and are consistent with the sectoral inventory chapters and the CRF tables, in particular information on the new gases "unspecified mix of HFCs and PFCs" and NF_3.	Resolved. The Party reported "unspecified mix of HFCs and PFCs" and NF_3 in the NIR (table ES.1) and the reported information is consistent with the sectoral inventory chapters, suggesting QA/QC procedures have been strengthened (see ID#s G.4 and I.12 in table 5).

[4] FCCC/ARR/2016/SWE.

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
G.2	QA/QC and verification (G.2, 2016) (G.2, 2015) Transparency	Improve the transparency of the QA/QC process by describing in the NIR the roles and responsibilities for the various stages of the process.	Resolved. The Party reported in the NIR (p.49) that the roles and responsibilities are in a separate document linked to in the NIR (*Manual for SMEDs. Quality System in the Swedish Air Emission Inventories*), which provides the information requested.
G.3	QA/QC and verification (G.3, 2016) (G.3, 2015) Adherence to the UNFCCC Annex I inventory reporting guidelines	Correct the outdated references to the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* in the NIR.	Addressing. The Party removed most of the references: only the reference on page 25 of the NIR remains in addition to the mention on page 365 of the use of that document as a comparison. During the review, Sweden informed the ERT that it uses the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* only when these guidelines are assumed to be more accurate than the 2006 IPCC Guidelines or when guidance is lacking in the latter. Sweden indicated that it will explain this clearly in the next NIR.
Energy			
E.1	1.A(b) Fuel combustion – reference approach – peat – CO_2 (E.4, 2016) Accuracy	Recalculate previous emissions from peat using AD from yearly energy balances in order to maintain time-series consistency.	Resolved. Sweden recalculated the emissions from peat for the whole time series using data from the energy balances (NIR, annex, p.148; CRF table 1.A(b)), although it was reported that this issue was not considered in this submission (NIR, p.451, table 9.5). See ID# G.4 in table 5.
E.2	Comparison with international data – liquid fuels – CO_2 (E.1, 2016) (E.1, 2015) (26, 2014) Comparability	Initiate a process to harmonize the fuel consumption data used for international reporting of marine bunkers to reduce the observed difference between the data reported in the CRF tables and the IEA data.	Resolved. Residual fuel oil consumption for international marine bunkers is 5–11 per cent higher in the CRF tables than that reported to IEA for most years. During the review, the Party explained that this is because different stock changes were applied owing to different data sources. In the GHG inventory the stock changes are based on statistics on foreign trade and in the Eurostat data (IEA reporting) they are based on preparedness stock estimates. The ERT considers the explanation for the difference reasonable and could not identify any potential underestimation or overestimation in the data submitted to the UNFCCC.
E.3	1.A Fuel combustion – sectoral approach – all fuels (E.5, 2016) (E.4, 2015) Comparability	Correctly reference the methodologies applied for the emission estimates in fuel combustion categories 1.A.2.f, 1.A.2.g, 1.A.3.a, 1.A.3.c, 1.A.3.d, 1.A.3.e, 1.A.4.a, 1.A.4.b, 1.A.4.c and 1.A.5.b.	Resolved. The Party updated the references to the methodologies applied to the categories. Categories 1.A.2.f, 1.A.2.g, 1.A.3.a, 1.A.3.c, 1.A.3.e, 1.A.4.a, 1.A.4.b, 1.A.4.c and 1.A.5.b have been referenced as tier 2 and category 1.A.3.d has been referenced as tier 1.
E.4	1.A.3.b Road transportation – liquid fuels – CO_2, CH_4 and N_2O (E.6, 2016) (E.5, 2015) Transparency	Provide documentation in the NIR to support the claim of insignificance for LPG consumption in accordance with decision 24/CP.19, annex I, paragraph 37(b).	Resolved. The Party reported CO_2, CH_4 and N_2O emissions from the use of LPG by road transportation for the first time in its 2017 submission (NIR, p.163; CRF table 1.A(a)s3).

ID[a]	*Issue and or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
E.5	1.A.3.d Domestic navigation – liquid fuels – CO_2 (E.3, 2016) (E.3, 2015) (33, 2014) Transparency	Provide an explanation of the observed fuel consumption trends between 2000 and 2012.	Resolved. In the NIR (pp.168–172), the Party reported several factors that affect the trend, including: a shift in the fuel consumption from "Domestic heating oil" to "Residual fuel oil" during the period 2009–2011; a review of the fuel consumption by leisure boats conducted in 2014, which resulted in an increase in the consumption of gasoline by leisure boats for 2005–2013; and the inclusion of diesel consumption by leisure boats for the whole time series.
E.6	1.A.5.b Mobile – biomass – CH_4 and N_2O (E.7, 2016) (E.6, 2015) Consistency	Harmonize the information presented in the NIR for CH_4 and N_2O emissions from biomass used for transportation fuel in the military in category 1.A.5.b (other – mobile) so that emissions are reported consistently.	Resolved. The Party mentioned in the NIR (p.187) that a special estimation for the use of fatty acid methyl ester was conducted by the military for the years 1999–2001 and emissions of CH_4 and N_2O from the use of ethanol by military road transportation were estimated using the tier 1 methodology. Emissions from biomass used for military transportation were reported in CRF table 1.A(a)s4 for the periods 1999–2001 and 2007–2014. Emissions were reported consistently.
E.7	1.B.1.b Solid fuel transformation – biomass – CH_4 (E.8, 2016) (E.7, 2015) Comparability	Report fugitive CH_4 emissions from charcoal production separately in category 1.A.1.c and describe in the NIR where in the CRF tables these emissions are reported.	Not resolved. Sweden continues to report "NO" for biomass consumed in solid fuel production and "NA" for CH_4 emissions from solid fuel transformation (CRF tables 1.A(a)s1 and 1.B.1). CH_4 emissions from charcoal production were not reported separately, and relevant information was not provided in the NIR to explain that emissions are occurring and are reported under category 1.A.2.g. During the review, the Party explained that the use of the notation key "NO" for category 1.A.1.c.i was an error and that it will be changed to "IE" because all the emissions from this category were included in the estimates in 1.A.2.g. The Party explained that charcoal is produced by small companies so these emissions are included in the estimates for small industries (category 1.A.2.g: other (manufacturing industries and construction)), for which the AD are provided as an aggregate from the energy balances, which in turn is based on intermittent surveys.
IPPU			
I.1	2. General (IPPU) (I.4, 2016) (I.4, 2015) Transparency	Report transparently the methodology applied for categories 2.A.2, 2.B.5, 2.B.10 and 2.C.4 in the IPPU sector in both the NIR and the CRF tables.	Resolved. The Party transparently reported the methodology applied for categories 2.A.2, 2.B.5, 2.B.10 and 2.C.4 in the "Summary of source category description" tables in the NIR.

ID#	*Issue and or problem classification[a]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.2	2. General (IPPU) (I.4, 2016) (I.4, 2015) Transparency	Report transparently the methodology applied for categories 2.C.2 and 2.C.7 in the IPPU sector in both the NIR and the CRF tables.	Not resolved. The Party did not report transparently the methodology applied for categories 2.C.2 and 2.C.7 in the "Summary of source category description" tables in the NIR. The methods for both of these categories describe the use of plant-specific data, therefore, the methods should be reported as tier 3 but in the NIR they are reported as tier 2 (2.C.2) and tier 1 (2.C.7). During the review, Sweden explained that it will review the method tiers and update the tables in the 2018 annual submission.
I.3	2.C.4 Magnesium production – SF_6 (I.6, 2016) (I.6, 2015) Transparency	Ensure that both the AD and SF_6 emissions are reported for magnesium production.	Addressing. The Party presented AD and an IEF for SF_6 emissions in CRF table 2(II)B-Hs1; however, the AD and IEF were not transparent because the AD description was incorrect. The AD in the CRF table were described as "amount of magnesium casted", while the AD provided in the CRF table were actually the annual amount of SF_6 used by the foundry. During the review, Sweden explained that despite research, annual production data for magnesium cast in the country are not available. The ERT concludes that the AD are not yet correctly reported owing to the error in the description.
I.4	2.D.1 Lubricant use – CO_2 (I.7, 2016) Transparency	Provide in the NIR a detailed explanation of and justification for the chosen method for estimating CO_2 emissions from lubricant use (e.g. holding AD constant for the latest year) to ensure transparency of the methodological approach to estimating emissions from lubricant use.	Addressing. The Party reported explicitly in the NIR (section 4.5.1.2) that the method is a one-year extrapolation from the latest available data, which improves the transparency of the method. Sweden did not provide in the NIR a justification for the approach used. During the review, the Party explained that because there is no clear trend in lubricant use over the past five years, simple extrapolation forward is considered to be the best available solution, and that while the Swedish Energy Agency has been consulted in the past to seek earlier data delivery, it has not been possible to obtain. The ERT is of the view that Sweden should annually review the recent trends in this category and amend the extrapolation approach, if needed, in order to ensure that the approach is consistent with the options presented to resolve data gaps in the 2006 IPCC Guidelines (volume 1, section 5.3).
I.5	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2 (I.8, 2016) (I.7, 2015) Completeness	Use a method to resolve any data gaps in accordance with the 2006 IPCC Guidelines to estimate CO_2 emissions from urea catalysts for the years for which AD are not available.	Resolved. The Party updated the reporting for this category in CRF table 2(I)A-Hs2 to report estimates for 1990–1994. However, Sweden did not document in the NIR any of the method changes (e.g. extrapolation approach) nor did the NIR include any mention of the recalculations. Further, table 4.33 in the NIR reported "NE" for CO_2 emissions from urea catalysts in 1990 (see ID# I.19 in table 5).

ID#	*Issue and/or problem classification*[a]	*Recommendation made in previous review report*	*ERT assessment and rationale*
I.6	2.F Product uses as substitutes for ozone-depleting substances – HFCs (I.1, 2016) (I.1, 2015) (43, 2014) (56, 2013) Transparency	Provide information in the NIR confirming that the national model used to calculate emissions from the consumption of halocarbons and SF_6 includes emissions from the collection, destruction and disposal of F-gases.	Resolved. The Party reported information on emissions from the collection, destruction and disposal of F-gases in the NIR (section 4.7.1). Table 4.38 in the NIR presents the national model assumptions on product remaining at disposal and also the percentage losses at disposal for numerous refrigeration and air-conditioning subapplications. Further, the NIR (annex 3.5) presents letters from two trade associations to validate the use of country-specific EFs at disposal (see ID# I.9 below).
I.7	2.F.1 Refrigeration and air conditioning – HFCs (I.3, 2016) (I.3, 2015) (45, 2014) Transparency	Document in the NIR the methodology used to derive the uncertainty data using expert judgment and revise the uncertainty estimates, if appropriate.	Addressing. The Party reported additional information regarding the level of uncertainty applied for this category. The NIR (section 4.7.1.3) states that the uncertainties are comparable with those applied in other countries, but it does not provide documentation of the methodology used to estimate uncertainties. During the review, Sweden explained that the uncertainty estimates are derived from expert judgment through consultation with experts from the Swedish Environmental Protection Agency, the Swedish Chemicals Agency and the Swedish Environmental Research Institute. Further, the Party noted that the uncertainties applied reflect the difficulty of accurately allocating emissions to industrial refrigeration, stationary air conditioning and commercial refrigeration.
I.8	2.F.1 Refrigeration and air conditioning – HFCs (I.9, 2016) (I.8 2015) Accuracy	Provide additional documented information in order to justify the use of a country-specific product life factor for HFC-125 emissions for category 2.F.1.	Not resolved. The Party's product life factor is still among the lowest of all reporting Parties, at about 2.1 per cent weighted average across all HFCs in 2.F.1.a (commercial refrigeration), and Sweden provided no justification for the country-specific factor. During the review, the Party explained that it is engaged in ongoing research to update the product life factor for the next submission. The ERT believes that this issue should be considered further in future reviews to confirm there is not an underestimation of emissions. See ID# I.20 in table 5.
I.9	2.F.1 Refrigeration and air conditioning – HFCs (I.10, 2016) (I.9, 2015) Transparency	Include, in the NIR, reference to the personal communications from the Swedish Refrigeration and Heat Pump Association and the Swedish Car Recyclers Association to support the use of the country-specific disposal loss factors.	Resolved. The Party included letter references from the Swedish Refrigeration and Heat Pump Association and the Swedish Car Recyclers Association to support the use of the country-specific disposal loss factors in the NIR (annex 3.5).
I.10	2.H Other (industrial processes and product use) – CH_4 and N_2O (I.12, 2016) (I.11, 2015) Comparability	Report AD for category 2.H.1 pulp and paper.	Not resolved. The Party reported the AD as "NE" in CRF table 2(I)A-Hs2 for category 2.H.1 (pulp and paper). During the review Sweden explained that it will report these AD in the 2018 submission.

ID#	*Issue and/or problem classification[a]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
Agriculture			
		There were no recommendations related to agriculture in the previous review report.	
LULUCF			
L.1	4. General (LULUCF) (L.5, 2016) (L.5, 2015) Comparability	Provide annual land-use change matrices for all years in CRF table 4.1.	Resolved. The Party reported in the NIR (p.458) that CRF table 4.1 is now complete and contains data for 1990–2015. The ERT agrees with this reporting.
L.2	4. General (LULUCF) – CO_2, CH_4 and N_2O (L.7, 2016) (L.7, 2015) Transparency	Provide, in the NIR, the rationale for the assumptions that impact the emissions reported for the key categories in the LULUCF sector (forest land remaining forest land, land converted to forest land, direct N_2O emissions from N inputs to managed soils, and biomass burning).	Resolved. The Party reported in the NIR (p.458) that, owing to the stock change method, all harvesting is indirectly reported. For N inputs, Sweden reported in the NIR (p.357) that normally fertilization is done around ten years before final felling. For biomass burning, the Party reported in the NIR (p.358) that forest fires are rare and are included in CRF table 4(V) using the notation key "IE" for wildfires in land converted to forest.
L.3	4.F.2 Land converted to other land – CO_2 (L.8, 2016) (L.8, 2015) Completeness	Report emissions from the loss of living biomass and emissions/removals from mineral soil carbon for all conversions to other land.	Not resolved. The Party reported in the NIR (p.459) that it assumes that land converted to unmanaged other land should not be reported. During the review, Sweden explained that this matter will be considered in future submissions. See also ID# L.7 in table 5.
L.4	4(III) Direct N_2O emissions from N mineralization/ immobilization – N_2O (L.4, 2016) (L.4, 2015) (58, 2014) (78, 2013) Accuracy	Make efforts to develop country-specific carbon/nitrogen ratios based on measurements of soil organic carbon to improve the accuracy of the N_2O emission calculations using a tier 2 method.	Addressing. The Party reported in the NIR (p.459) that this recommendation was not considered in this submission. During the review, Sweden explained that a project that may result in updated estimates in the next submission has been initiated.
L.5	4.G Harvested wood products – CO_2 (L.9, 2016) (l.9, 2015) Comparability	Complete CRF table 4.G and the additional information box on factors used to convert from product units to carbon.	Resolved. The Party reported in the NIR (p.460) that this recommendation has not been considered in this submission (see ID# G.4 in table 5). However, the ERT noted that in CRF table 4.Gs2, Sweden reports data from 1960 onwards; therefore it considers the recommendation resolved.
Waste			
W.1	5.A.1 Managed waste disposal sites – CH_4 (W.4, 2016) (W.4, 2015) Transparency	Include information on the content of Swedish household waste as a percentage or the degradable organic carbon content value for the major waste fractions (specified in table 7.8 on p.407 of the 2016 NIR) in the waste.	Resolved. The Party provided information on the fraction of degradable organic carbon for three different periods and on the k-values as well as data on the different waste fractions in the NIR (pp.395 and 396). The data presented are now comparable.

ID#	*Issue and or problem classification[a]*	*Recommendation made in previous review report*	*ERT assessment and rationale*
KP-LULUCF			
KL.1	General (KP-LULUCF) (KL.1, 2016) (KL.1, 2015) Transparency	Complete CRF table NIR-2 on an annual basis in accordance with the mandatory reporting requirement.	Resolved. The Party reported annual data for all years in CRF table NIR-2.
KL.2	General (KP-LULUCF) (KL.2, 2016) (KL.2, 2015) Transparency	Include information on the definitions selected by the Party for natural forests and planted forests, and the application of these definitions, in reporting in accordance with the requirements of decision 2/CMP.8, annex II, paragraph 5(d).	Resolved. The Party reported in the NIR (p.490) that all forest land is assumed managed and accordingly there are no natural forests.
KL.3	FM – CO_2, CH_4 and N_2O (KL.5, 2016) (KL.5, 2015) Transparency	Provide, in the NIR, information on the technical corrections in accordance with the annex to decision 2/CMP.7 and annex II to decision 2/CMP.8, including how the technical corrections impact areas under FM and the reasons for the deviation between FM activities and the FMRL.	Addressing. The Party reported in the NIR (p.491) on technical corrections to the FMRL, including the revised area of drained organic soil for forest land remaining forest land for the period 2000–2009. During the review, the Party explained that it considers that the accounting is balanced as long as the FM area does not deviate by more than a few per cent. The Party will provide additional information in the 2018 submission.
KL.4	Harvested wood products – CO_2 (KL.8, 2016) (KL.8, 2015) Transparency	Correct the information on HWP in the NIR (which incorrectly indicates that HWP are estimated and reported under FM) and report the notation keys consistently in the NIR and in CRF table 4(KP-I)C.	Resolved. The Party reported in the NIR (p.490) that the mandatory reporting of FM has been amended to include emissions/removals from HWP and included the notation key "NO" in CRF tables 4(KP-1)A.1 and 4(KP-I)C for AR.
KL.5	Harvested wood products – CO_2 (KL.9, 2016) (KL.9, 2015) Transparency	Correct the conversion factor for sawn wood from 0.52 to 0.42.	Resolved. The Party reported in the NIR (p.363) a value of 0.42 for the sawn wood conversion factor.
KL.6	Harvested wood products – CO_2 (KL.9, 2016) (KL.9, 2015) Transparency	Include information on the rationale for the country-specific HWP conversion factors for panels and sawn wood in the NIR (see ID# KL.5).	Not resolved. The Party did not report the rationale for the country-specific HWP conversion factors for panels and sawn wood in the NIR. During the review, Sweden explained that this information will be included in the next submission.

[a] References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) where the issue and/or problem was raised. Issues are identified in accordance with paragraphs 80–83 of the UNFCCC review guidelines and classified as per paragraph 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with paragraph 69 of the Article 8 review guidelines, in conjunction with decision 4/CMP.11.

IV. Issues identified in three successive reviews and not addressed by the Party

8. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2017 annual submission of Sweden, and have not been addressed by the Party.

Table 4
Issues identified in three successive reviews and not addressed by Sweden

ID#	*Previous recommendation for the issue identified*	*Number of successive reviews issue not addressed*[a]
General		
	No such general issues were identified	
Energy		
	No such issues for the energy sector were identified	
IPPU		
I.7	Document in the NIR the methodology used to derive the uncertainty data using expert judgment and revise the uncertainty estimates, if appropriate	3 (2014–2017)
Agriculture		
	No such issues for the agriculture sector were identified	
LULUCF		
L.4	Make efforts to develop country-specific carbon/nitrogen ratios based on measurements of soil organic carbon to improve the accuracy of the N_2O emission calculations using a tier 2 method	4 (2013–2017)
Waste		
	No such issues for the waste sector were identified	
KP-LULUCF		
	No such issues for KP-LULUCF activities were identified	

[a] The review of the 2016 annual submission was held in conjunction with the review of the 2015 annual submission. Since the reviews of the 2015 and 2016 annual submissions were not successive reviews, but were held in conjunction, for the purpose of counting successive years in table 4, 2015/2016 are considered as one year.

V. Additional findings made during the 2017 individual inventory review

9. Table 5 contains findings made by the ERT during the individual review of the 2017 annual submission of Sweden that are additional to those identified in table 3.

Table 5
Additional findings made during the 2017 individual review of the annual submission of Sweden

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
General			
G.4	General - NIR	The ERT noted that NIR table 9.5, "Provisional main findings reported by the ERT during the 2016 technical review of the annual submission of Sweden", reported some issues as "not considered" although the issues have been resolved in the NIR. Examples of these are ID#s G.1, E.1 and L.5 in table 3 above. The ERT recommends that Sweden update table 9.5 of the NIR annually in order to reflect the actual status of the implementation of previous recommendations in the latest annual submission.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
G.5	General - CRF tables	In the 2017 annual submission the Party reported emissions and/or AD as confidential for a large number of categories in the energy sector (1.A.1.a, 1.A.1.b, 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e and 1.A.2.f) and in the IPPU sector (2.B.5.b, 2.B.10, 2.C.1.c, 2.C.1.e, 2.C.7.c and 2.H.1). See ID#s E.9 and I.16 below. During the review, the Party explained that following a review of the management and reporting of national data in the inventory in 2016, it was determined that, in order to comply with the Swedish Public Access to Information and Secrecy Act, emission data may only be reported where operators in Sweden have provided written consent to the inventory agency. Written consent from all plant operators could not be gathered in time for the finalization of the 2017 annual submission, and therefore the NIR and CRF tables had sections marked as confidential, which limited the information available to the ERT, in particular for the IPPU and energy sectors. The Party provided all of the confidential information to the ERT during the review week. The ERT recommends that Sweden make efforts to progress the collection of consent from plant operators and to strive to report transparent data in future annual submissions while maintaining data confidentiality. The ERT encourages Sweden to develop appropriate procedures for the provision of confidential data, pending consent from plant operators, to future ERTs on request during the review in order to facilitate the review process.	Yes. Transparency
Energy			
E.8	Fuel combustion – reference approach – solid, liquid and gaseous fuels – CO_2	The Party reported in the NIR (p.122) and CRF table 1.A(c) that there were large differences (greater than 5 per cent or 10 per cent for some years after 2002) between the reference approach and the sectoral approach, but the ERT noted that there were no explanations for the large differences or references to the NIR provided in the CRF table. The NIR outlines several reasons for the discrepancies between the two approaches' totals, including: (1) inconsistencies in the supply-side statistics for petroleum fuels; and (2) the use of different AD for solid fuels, which may be based on different assumptions (e.g. NCVs), and for stock changes. However, the ERT noted that the NIR does not present other reasons for the differences, such as the uncertainties in EFs applied to primary fuels (e.g. carbon content of crude oil) or the differences of emission allocation, such as the CO_2 emissions from secondary gases in the IPPU sector (e.g. in 2.C.1, 2.C.7 and 2.B). During the review, the Party explained that a project is ongoing wherein AD are being discussed between the Swedish Energy Agency and the Swedish Environmental Emissions Data consortium, following a change in AD source for the reference approach estimates implemented in 2015. The Party will continue to investigate the differences between the	Not an issue/problem

ID[a]	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem?[a] If yes, classify by type
		facility-level data for the iron and steel category, the quarterly statistics and the energy balances for all fuel groups in order to further reduce and explain the differences between the two approaches. The ERT commends the Party for its efforts to date in revising the reference approach and in seeking to make improvements so as to reconcile the discrepancies between the two approaches, which will require consultation and resolution of data discrepancies across multiple organizations and agencies, including the steelworks operator and the Swedish Energy Agency. The ERT encourages Sweden to progress the research into improving the estimates for the reference approach, and to report on progress, including taking account of known differences (such as emissions allocated in the IPPU sector). Further, the ERT encourages the Party to revise and extend the analysis and documentation of findings from the comparison of the two approaches in the NIR and to provide in CRF table 1.A(c) a reference to the explanations in the NIR if discrepancies between the approaches are more than 2 per cent.	
E.9	1.A. Fuel combustion – sectoral approach – solid, liquid and gaseous fuels – CO_2, CH_4 and N_2O	The Party reported that, because plant-specific data were adopted for the emission estimates for categories 1.A.1.a, 1.A.1.b, 1.A.2.a, 1.A.2.b, 1.A.2.c, 1.A.2.d, 1.A.2.e and 1.A.2.f, AD and CO_2, CH_4 and N_2O emissions for these categories were reported as confidential (NIR, pp.130, 134, 136, 138, 141, 144, 146, 148, 149 and 151; CRF tables 1A(a)s1 and 1A(a)s2). During the review, the Party made available to the ERT, confidentially, a printout of CRF tables 1A(a)s1 and 1A(a)s2 containing data, including the confidential data, for all subcategories for the most recent three years. The ERT noted the progress achieved by the Party and that more energy data have become available from the Swedish Energy Agency – including energy balance sheets, "Energy in Sweden facts and figures" (a yearly collection of energy statistics published on the Swedish Energy Agency website), and monthly and quarterly energy surveys. The ERT recommends that Sweden enhance the transparency of reporting by exploring ways to minimize the number of categories reported as confidential while protecting the confidentiality of company data, for example by: (1) using weighted average EFs for one industry instead of directly citing each facility's data; (2) collecting consent from plant operators and reporting emissions in the CRF tables and NIR not as confidential information; or (3) for categories where AD and emissions are reported as confidential, maintaining AD as confidential but reporting emissions. The ERT also recommends that Sweden improve the transparency of the submission by providing clarification in the NIR on the key AD sources (the EU ETS, the national annual energy balance and other operator data provided to the inventory agency or obtained from annual environmental reports) and their use to derive estimates for the GHG inventory, for example, by using a schematic diagram to illustrate how the data are combined.	Yes. Comparability
E.10	1.A.2.a Iron and steel – solid fuels– CO_2	The IEFs for CO_2 emissions from solid fuels for iron and steel production have fluctuated considerably since 2006 (e.g. 214.5/170.2 t/TJ for 2005/2006, 221.3/165.6 t/TJ for 2008/2009), while for the years earlier than 2006 they were relatively stable at about 215 t/TJ. The Party explained in the NIR (p.136) that the inter-annual variations were caused by variations in the relative amounts of blast furnace gas and coke oven gas between years, and that the composition of each gas was also quite variable. The ERT commends the Party for providing these explanations, which improved the transparency of the reporting; however, they did not fully explain the overall trend of the CO_2 IEFs, especially for the years earlier than 2006 when the IEFs were quite stable and no changes on working conditions had been reported.	Yes. Transparency

ID[a]	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[b] If yes, classify by type*
		The ERT recommends that Sweden explore in more detail the causes of the trend of IEFs for CO_2 emissions from this category and update the explanation in the NIR for the next submission.	
IPPU			
I.11	2. General (IPPU) – CO_2, CH_4 and N_2O	The ERT noted that the reporting in the NIR and the CRF tables across several IPPU categories was not fully consistent and in some cases undermined the transparency of the submission for key and non-key categories. Specifically, the ERT noted that: (a) The AD and IEF for CO_2 emissions from 2.D.2 (paraffin wax use) were missing from the CRF tables for all years (the cells were blank). During the review, the Party provided these data to the ERT and cited problems with the CRF Reporter software as the reason for their omission from the CRF tables; (b) The AD for 2.B.5.b (calcium carbide production) were reported using the notation key "C" (confidential) in 2015, but in response to questions during the review, the Party explained that this was an error. Further, the Party clarified that calcium carbide production only contributed part of the emissions in this category as the Party also reports emissions from use of acetylene in this category, and that in future submissions the Party will provide more transparent details within the NIR for each subcategory included under 2.B.5.b; (c) The NIR (section 4.3.2.1) states that data for 2.B.2 (nitric acid production) in 2015 could not be reported owing to confidentiality issues; therefore, the data were omitted from NIR table 4.9 but the emissions, AD and IEF were provided in CRF table 2(I).A-Hs1. During the review, the Party clarified that the data were not confidential and that the NIR would be corrected in the next submission; (d) When comparing the AD, IEF and emissions for 2.A.2 (lime production) in the NIR (table 4.5) (for conventional lime plants) with the data in CRF table 2(I).A-Hs1 (for all of category 2.A.2, including lime production for the sugar industry and the paper and pulp industry), the IEF for the non-conventional lime production source categories was an implausibly high outlier in 2015 (1.82 t/t compared with 0.74 to 0.75 t/t for all other years in the time series). During the review, the Party clarified that the AD presented in the CRF table were incorrect for 2015 only, and that they would be corrected in the next submission. The ERT acknowledges that Sweden encountered problems with the CRF Reporter software and that these contributed to the inconsistencies in and incompleteness of the CRF tables. The ERT recommends that Sweden correct the errors in the NIR and the CRF tables, specifically: provide the AD and the CO_2 IEFs across the time series for 2.D.2 (paraffin wax use); remove the comment on confidentiality in the NIR and present time-series data in the NIR tables for 2.B.2 (nitric acid production); and correct the AD in the CRF table for 2015 for 2.A.2 (lime production). The ERT also recommends, in order to improve comparability, that the Party: report emissions from calcium carbide production in 2.B.5.b; present the AD, CO_2 and CH_4 IEFs transparently; and report the emissions from the use of acetylene in accordance with the 2006 IPCC Guidelines. The ERT encourages Sweden to improve its QA/QC for the NIR and CRF tables in order to minimize errors and inconsistencies in future submissions.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines

ID[a]	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?*[b] *If yes, classify by type*
I.12	NIR – NF_3	The amount of NF_3 emissions is reported as "NA" in the NIR (table ES.1) and CRF tables 10s5 and 10s6. During the review, Sweden explained that NF_3 emissions are not occurring and that the notation key for NF_3 will be corrected to "NO" in the NIR of the next submission. The ERT recommends that Sweden use the notation key "NO" for NF_3 both in the NIR (table ES.1) and in the CRF tables.	Yes. Comparability
I.13	2.A.2 Lime production – CO_2	The NIR (section 4.2.2.4) presents a comparison of AD for lime production from Statistics Sweden and the Swedish Lime Association and Swedish Lime Industry. The ERT noted that emission estimates from lime production are based directly on operator-reported emissions from the EU ETS for recent years, with the reported AD back-calculated using IPCC default EFs and impurity values (as described in section 4.2.2.2.1 of the NIR). The NIR (figure 4.6) shows a large disparity in the AD for lime production from Statistics Sweden and the trade associations across many years of the time series, including a difference of over 30 per cent in 2004. The NIR explains that the Statistics Sweden data are derived from incomplete surveys of the industry and that gap-filling of data is conducted by the statistics agency, which may explain the observed disparity. No further information is provided to explain this disparity in the AD for this key category, and it is unclear whether recent consultation with data providers has been conducted to assess the completeness of the inventory submission. During the review, the Party explained that a detailed review of data sources for lime production was conducted in 2015. The Party provided to the ERT the confidential report that is referenced in the NIR (Mawdsley, 2015), which identifies several potential sources of data discrepancy (such as reporting of biogenic CO_2 from reburning of lime kiln sludge), and which concludes that EU ETS data comprise the best available data set to inform emission estimates and that EU ETS-derived AD correspond well with the AD from the Swedish Lime Association. The Party clarified that consultation with data providers in recent years to check the comparison between AD and emission data has not been prioritized because of the outcome of the 2015 study that showed similarity between the EU ETS and other data sets. The ERT noted that achieving completeness for lime production estimates is challenging where many industry subsectors (such as sugar and paper and pulp) also generate and use lime, and commends the Party for the detailed study in 2015 to assess the completeness and consistency of data reported through a range of mechanisms in Sweden. The information provided during the review week indicates to the ERT that the reporting in 2.A.2 is complete. The ERT recommends that Sweden improve the transparency of the submission by describing more clearly in the NIR the category-specific QA/QC and verification undertaken; for example, by presenting a summary of the findings of the 2015 study, while maintaining data confidentiality, and noting the results of consultation with data providers to explain observed differences in AD and emission data among the various data sources. The ERT encourages Sweden to periodically revisit the comparison of AD reported by Statistics Sweden with other data sources and to consult with data providers to seek to reconcile known differences and verify that the inventory data are complete.	Yes. Transparency
I.14	2.A.4 Other process uses of	The NIR describes many sources of data and calculations for a range of industries that use limestone and dolomite (usually based on annual environmental reports by operators), and AD and emissions are reported across the IPPU sector,	Yes. Completeness

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
	carbonates – CO_2	in accordance with the 2006 IPCC Guidelines. However, the ERT noted that, although a lot of data is collected from individual industries, the risk of gaps in the overall data remains, and this is a key concern for the quality and completeness of the IPPU estimates. The ERT noted that the Party does not report on any overall quality checks on annual consumption of limestone and dolomite (i.e. to compare the sum of the reported limestone and dolomite by individual industries with the national balance of limestone and dolomite from production, import and export statistics, and with data on consumption of limestone and dolomite from industries within Sweden). The ERT also noted that, according to the 2006 IPCC Guidelines, this category should include emissive uses of carbonates in addition to limestone and dolomite (volume 3, section 2.5.1.2 refers to table 2.1, which includes several carbonates). During the review, the Party explained that current estimates for category 2.A.4 are based on verified EU ETS data and that while the Party does not conduct any overall quality checks on annual consumption, it would consider doing so if suitable data on national statistics were available. The ERT believes that this issue should be considered further in future reviews to confirm that there is not an underestimation of emissions. The ERT further noted that the key data providers to inform such a mass balance check for carbonate use are the Geological Survey of Sweden (for production data) and Statistics Sweden (for imports and exports), and that both of these organizations are government agencies involved in the national system. The ERT recommends that Sweden access the available data (i.e. the EU ETS data set that is currently used for the national inventory) and top-down data from national statistical agencies on production, imports, exports and known consumption of carbonates in order to assess any potential underreporting of emissions owing to incomplete coverage of emissive uses of carbonates, and report in the NIR on the comparison between: (1) the AD of limestone and dolomite reported in the inventory across all categories; and (2) the AD of total emissive uses of carbonates, which is derived from imports plus production minus exports and known uses.	
I.15	2.B.10 Other (chemical industry) – CO_2	The NIR (section 4.3.10) states that emissions from chemical and petrochemical production are all reported under 2.B.10 owing to difficulties in separating these emissions. However, the NIR (section 4.3.10.2) also states that for "some chemical industries" the CO_2 emissions are reported in the energy sector and the CO_2 emissions are derived directly from environmental reports from individual companies, using a tier 3 method. The ERT noted that there was a recalculation in the 2017 submission owing to the addition of emissions from two companies, of a total of about 70 installations reported under 2.B.10, leading to recalculations ranging from 16 to 30 per cent across the time series. The ERT also noted that in the NIR the method is not described in enough detail to enable the ERT to assess the scope, completeness and accuracy of the emission estimates. There is insufficient information on quality checks to ensure that the AD and emissions across the energy and IPPU sectors are complete and consistent with national energy balance data for feedstock use and the use of process off-gases as a fuel source in the energy sector, as well as with the reported EU ETS emission totals for chemical installations. The allocation of emissions across the energy and IPPU categories is unclear, and the submission is not comparable because of the aggregated reporting in category 2.B.10. During the review, the Party clarified: (1) details of the recalculation, which addressed gaps in emission estimates through a reanalysis of EU ETS data for two installations; (2) that emissions from ethylene other than flaring are reported in the energy sector; (3) that emissions from the *production* of fuels or heat supplied to other industries or district heating systems is reported where the emissions occur (thus at the chemical installations in the IPPU sector), but that where	Yes. Comparability

ID[a]	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem?[a] If yes, classify by type*
		process gases are then transferred to a facility within another source category (e.g. a district heating plant), emissions from the *combustion* of these process gases are allocated to the corresponding source category within the energy sector; and (4) that it recognizes that the reporting is not transparent and it is currently reanalysing reported energy and emission data at a number of facilities at the Stenungsund petrochemical complex in order to improve the allocation of emissions between the energy and IPPU sectors and thus better align them with the 2006 IPCC Guidelines. Improvements will be reported in the 2018 and 2019 submissions. The ERT refers the Party to the 2006 IPCC Guidelines, which state that "combustion emissions from fuels obtained from the feedstocks should be allocated to the source category in the IPPU sector. Where the fuels are transferred out of the process for combustion elsewhere (e.g. for district heating purposes) the emissions should be reported in the appropriate energy sector category" (section 3.9.1, p. 3.57). The reporting of the Swedish inventory described in item (2) in the previous paragraph is therefore not consistent with the 2006 IPCC Guidelines. The ERT recommends that Sweden improve the comparability of the submission by reporting the chemical category emissions in line with the 2006 IPCC Guidelines, including reporting emissions from ethylene production in the IPPU sector, and reporting on progress and any recalculations in the next submission. The ERT also recommends that the Party improve transparency by describing more clearly in the NIR: (a) The methodology, including the information provided to the ERT during the review, to clarify the allocation of emissions from the *production* of secondary fuels obtained from feedstocks and also from the *combustion* of process off-gases and residues where they are transferred to other source categories (including in the energy sector); (b) Data reconciliation checks for chemicals, for example by presenting information on: (i) A comparison of emissions reported in the national inventory across 2.B and 1.A with operator data from the EU ETS or environmental reports; (ii) A comparison of AD from the chemical installations with the national energy balance for primary and secondary fuels, so as to provide detailed data for ERTs to assess the accuracy and completeness of the inventory while protecting commercially confidential data.	
I.16	2.C.1 Iron and steel production – CO_2	The NIR (section 3.2.9.2.1) states that detailed carbon mass balances and energy balances for integrated steelworks were provided in annex 3.4, but this information was not included in that annex of the NIR. Furthermore, the NIR does not provide information on the allocation of emissions from process gas (from iron and steel production) use in co-located plants in other industries (e.g. power plants in 1.A.1.a), or on the reconciliation of AD of these process gases with the national energy balance. Emissions of CO_2 are estimated using a tier 3 method, using operator data, but no supporting data (e.g. the coking coal CEF time series) are presented in the NIR. This lack of transparency prevented the ERT from being able to assess the completeness and accuracy of the 2015 emissions and AD for the iron and steel industry across the IPPU and energy sectors. During the review, the Party provided the carbon and energy balances for the two integrated steelworks for 2015, and	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		explained that the information presented in the 2017 submission was limited owing to data confidentiality following a national review of inventory reporting of confidential operator data in 2016 (see ID# G.5 above). The Party explained that written consent is now being sought from plant operators in order to enable the transparent reporting of emission data for iron and steel production across the energy and IPPU sectors, consistent with the 2016 and earlier submissions. The Party stated that, in the event that written consent from all operators is not obtained in time for the next submission, the carbon and energy balances would continue to be made available to future ERTs during the review in order to improve the transparency of the submission. Based on the information provided during the review week, the ERT was satisfied that the Party's estimates for 2.C.1 are based on the best available data from the plant operators, which are consistent with EU ETS data and are complete for all emission sources. The ERT recommends that Sweden improve transparency by reviewing and updating the descriptions in the NIR of: (a) The methodology for estimating emissions from iron and steel production; (b) Data reconciliation checks for integrated steelworks, for example by presenting information on: (i) A comparison of emissions reported in the national inventory across 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b with operator data from the EU ETS or environmental reports; (ii) A comparison of AD from the integrated steelworks with the national energy balance for primary and secondary fuels, so as to provide sufficient detail for ERTs to assess the accuracy and completeness of the submission while protecting commercially confidential data. The ERT encourages Sweden to present, as an annex to the NIR, extracts from the report *Emissions from Integrated Iron and Steel Industry in Sweden* (Gustafsson et al, 2011), which is in the public domain and which the ERT notes contains many details on plant design and use of process gases and options to allocate emissions and develop time series consistent methodologies for integrated steelworks. The ERT also recommends that Sweden improve the transparency of the key input data that govern the emission estimates from integrated steelworks by reporting a full time series of the coking coal CEF used to generate the emission estimates, including references for the data sources across the time series. The ERT notes that if these data cannot be published in future submissions because of commercial confidentiality concerns, then these data may be provided solely to the ERT for the purpose of the review.	
I.17	2.C.1 Iron and steel production – CO_2	The ERT noted that the 2015 carbon and energy balance information for integrated steelworks include data on the CEFs and NCVs for coking coal and coke oven coke across the two integrated steelworks that are inconsistent; for example, data for coking coal across the two plants are identical for NCVs but have a difference of about 11 per cent for CEFs. The ERT also noted that in CRF table 1.A(c), the comparison of the reference approach and sectoral approach for solid fuels in 2015 indicates that the AD in energy terms are 30 per cent lower in the sectoral approach although CO_2 emissions are 19 per cent higher. The ERT considers that this inconsistency in reporting of the inputs (energy and carbon) to integrated steelworks is a significant issue that may lead to inaccurate estimates for solid fuel use and emissions within the Swedish inventory and is undermining comparison of the two approaches. The ERT further noted that the AD for solid fuel use in	Yes. Accuracy

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem?[a] If yes, classify by type
		steelworks are used in conjunction with other data sources (e.g. the national energy balance) to generate the overall solid fuel balance for the inventory, and therefore the accuracy of the steelworks data may lead to underestimations or overestimations across many categories of the energy and IPPU sectors. During the review, the Party explained that the inventory agency had consulted with the steelworks operator and the Swedish Energy Agency during 2016 and 2017, and a review of the category data had concluded that the steelworks' NCV was notably different from the NCV for solid fuel assumed in the development of energy statistics by the Swedish Energy Agency and that this may be leading to inaccurate AD in the Swedish inventory. The Party explained that ongoing work with the steelworks operator would improve the data used for the carbon and energy balances but that this improvement might not be achieved in time for the 2018 submission. The ERT believes that this issue should be considered further in future reviews to confirm there is not an underestimation of emissions. The ERT notes that this is potentially a substantial issue with impacts across the energy and IPPU sectors while commending the Party for progressing research into this issue. The ERT recommends that Sweden make efforts to harmonize and improve the accuracy of the data reported by the steelworks operators and the Swedish Energy Agency and report on progress in the next NIR, including that it: (a) Provide full details of AD and emissions for all source categories affected across energy and IPPU, including data on fuel NCVs and CEFs. If these data cannot be published in future submissions because of commercial confidentiality concerns, then these data may be provided solely to the ERT for the purpose of the review, so as to facilitate assessment of completeness and accuracy of the reporting; (b) Report on any recalculations to emissions and AD across the time series of sources in the energy and IPPU sectors affected by the integrated steelworks (i.e. 1.A.1.a, 1.A.1.c, 1.A.2.a, 1.B.1.c and 2.C.1.b); (c) Present a clear plan of tasks and associated time frames for completing the improvements if they are not achieved in time for the 2018 annual submission; (d) Report on the comparison between the reference approach and sectoral approach for solid fuel energy use and emissions, and outline changes in the overall comparison as a result of improvements in the harmonization of NCVs and AD for solid fuels between steelworks operators and the Swedish Energy Agency.	
I.18	2.C.7 Other (metal industry) – CO_2	The Party reported limited data and methodological details for the emission estimates from one NFM smelter and one lead recycling plant in Sweden, and the ERT noted that, similar to the issues above (ID#s I.15 and I.17), the transparency of the reporting on energy use and emissions between the energy and IPPU sectors is limited in the NIR. The NIR (section 4.4.7.2) includes details of research conducted in 2015 to improve the estimation method, with improvements implemented in the 2016 submission following a review of energy and emission data at the NFM smelter using EU ETS data. During the review, the Party provided the confidential data for the 2015 emissions, and also the confidential report on the review in 2015 of data for the NFM smelter (Yaramenka and Mawdsley, 2015). The ERT reviewed that paper and noted that the research compared AD and EFs applied in the inventory with EU ETS data, and this led to improvements across the time series through access to installation-specific EFs for input fuels and reductants and through access to more	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem[a] If yes, classify by type
		accurate AD, especially for waste-derived process inputs. The Party also explained that further research to review energy and emission data that the other facility reported in this category is under way. Further, the Party stated that the inventory agency conducted research in 2017 to develop a new 'CRF1–CRF2' balance sheet for emissions and AD reported by industries where emissions are reported across energy ('CRF1') and IPPU ('CRF2') categories. This new balance sheet will enable the inventory agency to transparently allocate emissions and AD provided by operators from EU ETS or from environmental reports to energy and IPPU categories, and will facilitate quality checking of the national inventory data against EU ETS and the national energy balance to help minimize the risk of gaps and double counting in future submissions. The Party stated that the balance sheet will not be published in future NIRs because of data confidentiality limitations, but that the balance sheet would be made available to future ERTs in order to improve the transparency of the submission and to assure ERTs of the accuracy and completeness of the Swedish inventory. The ERT commends the Party on its extensive efforts to improve the emission estimates through recent research and to develop the 'CRF1–CRF2' balance sheet, and encourages the Party to continue its research as well as provide the balance sheet to future ERTs as it will significantly improve the transparency of the sector estimates and the completeness of the reporting on the energy and IPPU sectors. The ERT recommends that Sweden further improve the reporting of category 2.C.7 (other (metal industry)) emissions to bring them in line with the 2006 IPCC Guidelines by transparently reporting energy use and emissions between the energy and IPPU sectors, and that it report on progress and any recalculations in the NIR.	
I.19	2.D.3 Other (non-energy products from fuels and solvent use) – CO_2	The Party updated the reporting for urea use as a catalyst in CRF table 2(I)A.Hs-2 with new estimates for 1990–1994; emissions for these years had previously been reported as "NE" (see ID# I.5 in table 3). The ERT noted, however, that the Party did not document in the NIR any of the method changes (e.g. extrapolation approach to fill the data gap), the NIR did not include any mention of the recalculations, and the NIR (table 4.33) still reports "NE" for 1990. Furthermore, the NIR includes no methodological details for the emission estimates from urea use as a catalyst, other than to say that the method is in accordance with the 2006 IPCC Guidelines. The recalculations and the estimation method are therefore not reported transparently, and the information in the NIR and CRF tables is inconsistent. During the review, the Party confirmed that the emission estimates for this category are calculated using the mobile combustion chapter of the 2006 IPCC Guidelines (section 3.2.1.1, table 3.2.2), assuming 100 per cent purity of the urea. Further, the Party explained that the reporting in the NIR and CRF tables would be updated in the 2018 annual submission. The ERT recommends that Sweden report in the NIR the method, source data, assumptions and extrapolation back to 1990 related to urea use as a catalyst, and correct the discrepancies between the NIR and the CRF tables in order to clarify in the NIR that emissions are estimated for 1990.	Yes. Transparency
I.20	2.F.1 Refrigeration and air conditioning –	This issue follows on from ID# I.8 in table 3 above. The Party reported emissions of HFCs and PFCs from commercial refrigeration, industrial refrigeration, stationary air conditioning and heat pumps, all aggregated under 2.F.1.a (commercial refrigeration). In 2015, the weighted-average product life factor across all gases was 2.08 per cent, which is	Yes. Accuracy

ID[a]	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem[b] If yes, classify by type
	HFCs and PFCs	one of the lowest factors of all reporting Parties. The ERT noted that this factor was much lower than product life factors in neighbouring countries. The ERT also noted that while the weighted-average product life factor falls within the range of factors provided in the 2006 IPCC Guidelines (volume 3, chapter 7, table 7.9) for stand-alone commercial refrigeration (1–15 per cent) and stationary air conditioning and heat pumps (1–10 per cent), the product life factor is well below the range of factors presented for medium and large commercial refrigeration (10–35 per cent) and industrial refrigeration (7–25 per cent). During the review, the Party did not provide information to verify the use of the country-specific leakage rates during product use, but explained that in response to recommendations from previous reviews, research is under way to develop new country-specific factors and to improve the Swedish F-gas model for refrigeration and air-conditioning sources, including: (1) a survey has been conducted with neighbouring countries to identify outlier EFs in the Swedish model; (2) the Party is consulting on this matter with the Swedish Refrigeration and Heat Pump Association; (3) the Party is reviewing new evidence from a major German survey in 2017 (published in *Branchenbuch der Kälte- und Klimatechnik*, 2017), which shows leakage factors significantly lower than the lowest leakage factors in the 2006 IPCC Guidelines; and (4) new data on F-gases imported in pre-filled appliances has been identified and will be taken into account in the 2018 submission. The Party explained that, although data are limited for some subapplications, it is confident that there is sufficient information to present a more accurate inventory submission in 2018, separating rather than aggregating estimates for commercial refrigeration, industrial refrigeration, stationary air conditioning and heat pumps. The Party noted that in the event that it cannot determine new country-specific product lifetime factors that are well founded, it would apply default factors from the 2006 IPCC Guidelines. The ERT believes that this issue should be considered further in future reviews to confirm that there is not an underestimation of emissions, while commending the Party for progressing research into improving the accuracy of the Swedish F-gas model. The ERT recommends that Sweden update the product life factors in the next annual submission, either by utilizing new country-specific factors, providing supporting evidence for their use, or by applying default factors from the 2006 IPCC Guidelines, while ensuring that time-series consistency is maintained in the Swedish F-gas model. If this is not achieved before the 2018 submission, the ERT recommends that the Party report on progress of F-gas model improvement and present a clear plan of tasks and associated time frames for their completion. The ERT also recommends that Sweden include the new data on F-gases in pre-filled units imported into the country. The ERT acknowledges that implementing such a comprehensive improvement to the national F-gas model and conducting rigorous QA/QC of such model revisions (e.g. peer review), in particular to incorporate new data and ensure time-series consistency and to revise model uncertainties, may not be achievable in time for the 2018 submission. The ERT therefore encourages Sweden to ensure that sufficient resources are made available to implement these improvements in a timely manner.	
I.21	2.F.1 Refrigeration and air conditioning – HFCs and PFCs	The Party reported EFs for initial charging of commercial refrigeration in the NIR (table 4.42) that were inconsistent with the rates presented in CRF table 2(II)B.Hs-2; for example, for 1995 the NIR states 5.7 per cent and the CRF table 3.5 per cent. The ERT noted that the initial charge in NIR table 4.42 is 3.5 kg, and considered that this may indicate either a typographical error in the NIR or an incorrect leakage rate applied in the Swedish refrigeration and air-conditioning model. During the review, the Party explained that, owing to the aggregation of multiple sources within the Swedish F-gas	Yes. Comparability

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem?[a] If yes, classify by type
		model which are reported in 2.F.1.a, including heat pumps (the leakage rate for which is 1 per cent, presented in table 4.41 of the NIR), the tables in the NIR and the CRF tables do not match. The Party noted that in the 2018 submission it would report the emission data in individual categories, with heat pumps to be reported under 2.F.1.f. The ERT recommends that Sweden report emissions from heat pumps separately under 2.F.1.f, including any details of recalculations from the redesign of the refrigeration and air-conditioning model. The ERT encourages Sweden to ensure that the changes in reporting are subject to rigorous QA/QC in order to ensure that leakage rates for individual subapplications are applied correctly in the model, and to ensure consistency between the NIR and the CRF tables.	
Agriculture			
A.1	3. General (agriculture) – CH_4 and N_2O	In the sections "source-specific recalculations" in the agriculture chapter of the NIR, the reasons for recalculations of each emission source were provided. Further, the impact of the recalculations on total emissions by source and by gas was provided in the CRF tables. However, the Party did not report in the NIR the quantitative impact of the recalculations on the trend in emissions at the category, sector and national level, in accordance with the UNFCCC Annex I inventory reporting guidelines. During the review, Sweden explained that the qualitative explanation for the recalculation was provided in the NIR (sections 5.2.5, p.314; 5.3.5, p.322; 5.4.1.1.9, p.329; and 5.4.2.5, p.334). The quantitative comparison was reported in the CRF tables. The ERT encourages Sweden to report a description of the quantitative impact of the recalculations on the trend in emissions at the category, sector and national level in each section of source-specific recalculations in the NIR, as appropriate.	Not an issue/problem
A.2	3.A.1 Cattle – CH_4	The Party reported the unit for milk delivered by dairy cattle in the NIR (p.313, table 5.6) incorrectly. The ERT noted that the unit for total milk delivered is tonne and that the figures for the whole time series are too small for national total milk production. During the review, the Party explained that the unit is not correct. It should be 1,000 t. The ERT recommends that Sweden correct the unit used for total milk delivered.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
A.3	3.B.3 Swine – CH_4 and N_2O	The ERT noted that in the 2017 annual submission, the Party reported the liquid waste manure management system (fraction) for "Pigs for meat production" as 0.95, and for "Other swine" as 0.58, in 2013 and 2014. However, in the 2016 submission, the liquid waste manure management system (fraction) for "Pigs for meat production" was 0.97, and for "Other swine" was 0.74, for 2013 and 2014. Solid waste manure management systems and deep litter manure management systems fractions for "Pigs for meat production" and "Other swine" were also different in the two submissions. The ERT noted that there is no explanation in the NIR for such changes between these two recent submissions. During the review, the Party explained that a development project was carried out to improve the calculations model for the reporting of ammonia for the Convention on Long-range Transboundary Air Pollution (NIR, p.322). Also, the ERT noted that the distribution of manure management systems for dairy cattle and subcategories of non-dairy cattle was updated. However, it is not clearly described in the NIR (p.322) that the manure management	Yes. Transparency

ID[a]	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem?[a] If yes, classify by type
		systems of swine were affected. The ERT recommends that Sweden report on any recalculations that have an impact on manure management systems for swine.	
A.4	3.D.b.1 Atmospheric deposition – N_2O	The Party reported the emissions of ammonia from eight fertilizer types in the NIR (p.331, table 5.24); however, the source for the emission estimates of ammonia from these fertilizer types was not provided. The unit for $Frac_{GASF}$ (kg NH_3/kg N) (p.331, table 5.24) is incorrect. Also, the Party did not report emissions of ammonia from "Other NK and NPK fertilizers" in the NIR (p.331, table 5.24), while in NIR table 5.25, the amount of N in "Other NK and NPK" is about 30 per cent of total N in inorganic fertilizers (e.g. 32.9 per cent in 1990 and 32.1 per cent in 2015). The ERT noted that reporting the derived weighted average $Frac_{GASF}$ in table 5.25 is not transparent if the emissions of ammonia from "Other NK and NPK" are not provided in table 5.24. During the review, the Party explained that the data for loss as ammonia for different fertilizer types are from the *EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013*. The Party stated that the unit of $Frac_{GASF}$ is incorrect only in the NIR, and that the estimate of indirect N_2O emissions from ammonia volatilization is correct. $Frac_{GASF}$ for "Other NK and NPK fertilizers" is the same as that for ammonium nitrate, which is also from the guidebook. The ERT recommends that Sweden improve the transparency of its reporting by providing in the NIR: (1) the data sources for emissions of ammonia from all fertilizers; (2) the correct units for $Frac_{GASF}$; and (3) the emissions of ammonia from "Other NK and NPK fertilizers".	Yes. Transparency
LULUCF			
L.6	4.A Forest land – CO_2	The Party reported in the NIR (annex 3, p.96) that for organic soils (CRF table 4.A), EFs are applied without any consideration to carbon inputs from litter, but in CRF table 4.A, carbon stock changes in litter are reported. During the review, the Party explained that previous EFs used by the Party for drained organic soils did not include carbon gain in soils from litter and root mortality, but that the new EFs from the Wetlands Supplement include the carbon inputs from litter. The ERT recommends that Sweden delete the erroneous wording in the NIR (annex 3, p.96) that states carbon inputs from litter were not considered.	Yes. Adherence to the UNFCCC Annex I inventory reporting guidelines
L.7	4.A Forest land	The Party reported in CRF table 4.1 changes from forest land (managed) to other land (unmanaged) and to wetlands (unmanaged) and vice versa, since 1990. The Party reported all areas, managed or unmanaged. The Party reported "human induced" carbon changes only, where "human induced" has the interpretation of "managed" (i.e. the carbon stock change on unmanaged land is set to zero), as stated in the NIR (p.353). The ERT noted that the Party includes in the definition of forest land that the forest land must meet the national thresholds of tree crown cover, minimum area and tree minimum height; further, the land is only considered to be forest land if the predominant land use is forestry (NIR, p.346). In the descriptions of land-use change from managed forest land to unmanaged land, it is not clear in the NIR whether such change was caused by a change in land use or by the fact that the predominant land use of forest land was no longer considered to be forestry. Additionally, it is not transparent whether these land-use conversions were accompanied by a	Yes. Transparency

ID[a]	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem[c]? If yes, classify by type
		gain or loss of biomass during the conversion period of the land-use change, and if so, for what area and how these were included in the estimates of reported changes in carbon pools. During the review, the Party explained that: (a) According to the national forest inventory, when a plot fulfills the definition for wetland (wetlands include land that is regularly covered or saturated with water, at least during part of the year, including lakes, marshes, streams (more than 2 m wide), ponds, and marshes not classified as forests), this area is reported as a land-use change to wetland (even when the land cover has not changed). As wetlands are defined by the Party as unmanaged, former forest land may become unmanaged land; (b) According to the national forest inventory, when a plot of unmanaged land is noticed as meeting the forest definition, this former unmanaged land (previously reported as unmanaged other land or wetland) will be reported as other land or wetland changed to forest land under the Convention and added to the area of FM under the Kyoto Protocol. Carbon stock change in living biomass is measured on the plots while emissions and removals for soil are calculated using the average values and calculations as forest land; (c) All land that meets the FAO forest definition is reported as forest land if there is no evidence of any other predominant land use (for instance, if the land meets the FAO definition but is used for grazing). If there is unmanaged land (wetlands or other land) that is judged to meet the FAO forest definition it will be reported as wetlands or other land converted to forest land. If there are sparsely growing trees on a mire that do not meet the forest definition it will remain under the category wetlands remaining wetlands. All areas are reported in CRF table 4.1; (d) Living biomass is measured on almost all land and the stock change takes into account the biomass before and after a land-use conversion; for example, in mountainous areas, if the biomass is not measured before a land-use conversion, a stock change of zero is assumed; (e) A system of rules for the assessment of land-use changes will be implemented for the next submission. Within this system the land-use changes from forest land to wetlands will be based on strong evidence of their occurrence. The ERT recommends that Sweden: (a) Report transparently the change of forest land to wetlands and other land, and the change from wetlands and other land to forest land, as well as the accompanying gains and losses in the carbon pools when methods are provided in the 2006 IPCC Guidelines, by providing information on whether a land-use change from forest land is caused by the fact that the national requirements for forest land are no longer met or by the fact that the dominant land use is no longer forestry, and, in cases where the allocation of the land under forest land was not "temporary unstocked" but the land use really changed, considering using a subcategory for this land-use change; (b) Document and report the procedure describing when forest land changes to other land, taking into consideration that the definition of forest land use by the Party does not restrict forest land to productive forest and that the 2006 IPCC Guidelines also include, under managed land, land that performs ecological or social functions; (c) Improve transparency by reporting in the NIR how the carbon pools other than biomass are estimated in case of a land-use change from unmanaged land to managed forest land;	

ID[a]	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and or a problem?[b] If yes, classify by type
		(d) Report on the improved national system of rules for the assessment of land-use changes.	
L.8	4.C Grassland – CO_2	The Party reported in the NIR (annex 3, p.97) that it applies the CO_2 EF for drained organic soil in forest land as included in the Wetlands Supplement for drained organic soil in grassland. However, the ERT noted that this is not in accordance with the Wetlands Supplement (chapter 2, table 2.1) because that section provides also a default value for drained organic soil in grassland. During the review, the Party explained that the reason for applying to grassland the EF for forest land is that grassland in Swedish reporting is defined as natural grazing land with soil conditions closer to forest land (some trees are often left, bare rocks are present, and the land is not tilled) than to grassland as defined in the Wetlands Supplement. The ERT recommends that the Party improve the transparency of its reporting by providing information on the choice of the country-specific CO_2 EF for drained organic soil in grassland.	Yes. Transparency
L.9	4 (II) Emissions and removals from drainage and rewetting and other management of organic/mineral soils – CH_4	The Party reported that ditches are included under the category "9. Road and railroad" (settlements) in the NIR (p.347), while emissions from ditches are related to drainage that mostly happens in forest land, grassland or cropland. During the review, the Party explained that ditches which are referred to under category "9. Road and railroad" are ditches alongside roads and railroads, and they are not the same ditches as those that are established to drain forest land, grassland or cropland. The Party also provided information on the estimation of CH_4 emissions from ditches, based on country-specific values. The ERT recommends that the Party improve transparency by reporting in the NIR: (1) that the ditches reported under category "9. Road and railroad" are ditches alongside roads and railroads only; and (2) that the EF per ha for all ditches is country-specific, because the area of ditches is estimated based on a factor for the fraction of the drained area (i.e. 2.5 per cent for forest land and 5 per cent for grassland and cropland) and this factor is applied to the country-specific EF by land use.	Yes. Transparency
L.10	4(V) Biomass burning – CO_2, CH_4 and N_2O	The Party reported that it assumed that 25 per cent of pre-fire biomass stock is combusted during a fire. The Party reported that it finds a combusted proportion of 25 per cent more realistic than the EFs in the 2006 IPCC Guidelines, and provided a reference in the NIR (p.365, figure 6.6) to a picture of post-fire biomass after the 2014 Västmanland wildfire in Sweden. The ERT noted that this is insufficient documentation of a country-specific value. During the review, the Party explained that the amount of burned biomass is an expert judgment, based on discussions with experts on wildfires. The picture is of the largest wildfire in the country for a hundred years, which covered about 15,000 ha. After that fire, a lot of biomass died (and is thereafter reported as deadwood), and the burned proportion was estimated to be 25 per cent (based on opinion by a group of people visiting many places within the burned area). The ERT considers the estimation of this 25 per cent as appropriate. The ERT recommends that Sweden improve the transparency of its reporting by providing information on how it estimates the country-specific value (25 per cent) for the pre-fire biomass stock that is combusted during a fire.	Yes. Transparency

ID#	*Finding classification*	*Description of the finding with recommendation or encouragement*	*Is finding an issue and/or a problem*[a] *If yes, classify by type*
Waste			
W.2	5.C.1 Waste incineration – indirect gases	In CRF table 5, the Party reports indirect gases from waste incineration. The ERT noted that these gases are not mentioned in the NIR (chapter 9). During the review, the Party explained that sulfur dioxide, nitrogen oxides and carbon monoxide are continuously measured in flue gases and reported by the incineration facility in the yearly environmental reports. NMVOC emissions were as reported by the incineration facility until 2007. From 2007 and onwards the NMVOC emissions were calculated based on the IEF for 2007 and yearly incinerated amounts of waste. Documentation of emission estimates of indirect GHGs will be included in the NIR of the 2018 submission. The ERT recommends that Sweden improve the transparency of its reporting by presenting information on the emission estimates of indirect GHGs from waste incineration in the NIR.	Yes. Transparency
KP-LULUCF			
KL.7	Article 3.3 activities	The Party reported in the NIR (section 6.3.1.1 and figure 6.5) that inventory cycles (five sample series) without a full record to 2015 are extrapolated. This results in extrapolations of areas. Related to table NIR-2, Sweden reports that it finds it inaccurate to extrapolate areas of land-use conversions (NIR, p. 475). During the review, the Party explained that it extrapolates areas for land use and land-use conversion using the trends, and that the comment to table NIR-2 should be read as that the Party does not extrapolate land-use conversions for individual plots. The ERT recommends that Sweden improve transparency by revising the comment to table NIR-2 to clarify that the extrapolation of areas for land use and land-use conversion is done using the trends and not using extrapolated land-use conversions for individual plots.	Yes. Transparency
KL.8	FM	The Party reported that the area of FM increased from 28.06 million ha in 2004 to 28.30 million ha in 2015 (NIR, table 10.6) but did not provide the additional data necessary to support such an increase, which are necessary because in almost all situations the area of FM is expected to decrease owing to deforestation. During the review, the Party explained that land-use change from forest land to wetlands or other land (if it happens) is not defined as "deforestation" because such land-use changes are considered non-anthropogenic and these land areas are kept under FM, and because accounted land cannot leave the accounting system. Similarly, the corresponding land-use change from wetlands and other land to forest land is not considered AR and is therefore reported as FM, and the area may thus increase if these land-use changes are greater than deforestation. The Party stated that studying the trees and land use of the same sample plot for consecutive inventories confirmed that the land-use changes did not take place in combination with deforestation activities. The ERT recommends that Sweden report information that supports the assumption that land-use changes from forest to wetlands or other land (if they happen) are not taking place in combination with deforestation activities.	Yes. Transparency

[a] Recommendations made by the ERT during the review are related to issues as defined in paragraph 81 of the UNFCCC review guidelines, or problems as defined in paragraph 69 of the Article 8 review guidelines. Encouragements are made to the Party to address all findings not related to such issues or problems.

VI. Application of adjustments

10. The ERT has not identified the need to apply any adjustments to the 2017 annual submission of Sweden.

VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol

11. Sweden has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable for the 2017 review.

VIII. Questions of implementation

12. No questions of implementation were identified by the ERT during the review.

Annex I

Overview of greenhouse gas emissions and removals for Sweden for submission year 2017 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Sweden

1. Tables 6–9 provide an overview of total GHG emissions and removals as submitted by Sweden.

Table 6

Total greenhouse gas emissions for Sweden, base year[a]–2015

(kt CO_2 eq)

	Total GHG emissions excluding indirect CO_2 emissions		*Total GHG emissions including indirect CO_2 emissions[b]*		*Land-use change (Article 3.7 bis as contained in the Doha Amendment)[c]*	*KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)[d]*	*KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)*	
	Total including LULUCF	*Total excluding LULUCF*	*Total including LULUCF*	*Total excluding LULUCF*			*CM, GM, RV, WDR*	*FM*
FMRL								–41 336.10
Base year	35 074.93	71 778.11	NA	NA	NA		NA	
1990	34 933.43	71 636.61	NA	NA				
1995	41 054.45	73 776.68	NA	NA				
2000	30 775.23	68 697.67	NA	NA				
2010	16 513.40	64 554.80	NA	NA				
2011	19 459.69	60 554.99	NA	NA				
2012	10 350.98	57 162.72	NA	NA				
2013	10 829.38	55 537.40	NA	NA		2 386.64	NA	–53 243.86
2014	8 659.96	53 836.24	NA	NA		1 838.62	NA	–53 180.72
2015	3 177.33	53 690.36	NA	NA		777.15	NA	–52 982.04

Note: Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions.

[a] Base year refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs, SF_6 and NF_3. Sweden has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The Party has not reported indirect CO_2 emissions in CRF table 6.

[c] The value reported in this column refers to 1990.

[d] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely AR, and deforestation.

Table 7
Greenhouse gas emissions by gas for Sweden, excluding land use, land-use change and forestry, 1990–2015
(kt CO_2 eq)

	CO_2[a]	CH_4	N_2O	HFCs	PFCs	Unspecified mix of HFCs and PFCs	SF_6	NF_3
1990	57 548.32	7 639.72	5 773.46	4.60	568.78	NA	101.73	NA
1995	59 292.75	7 610.64	6 056.67	149.18	532.24	NA	135.19	NA
2000	54 727.15	7 051.47	5 795.97	631.37	372.93	NA	118.78	NA
2010	53 024.18	5 507.72	4 822.95	950.24	186.81	NA	62.91	NA
2011	49 097.12	5 379.82	4 892.80	915.23	215.25	NA	54.77	NA
2012	46 522.67	5 208.95	4 429.69	869.97	79.11	NA	52.34	NA
2013	44 879.36	5 110.73	4 616.01	838.55	51.54	NA	41.21	NA
2014	43 254.66	4 977.03	4 666.40	810.59	82.57	NA	44.99	NA
2015	43 346.28	4 872.36	4 608.49	773.11	35.84	NA	54.28	NA
Per cent change 1990–2015	**–24.7**	**–36.2**	**–20.2**	**16 698.1**	**–93.7**	**NA**	**–46.6**	**NA**

Note: Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions.
[a] Sweden did not report indirect CO_2 emissions in CRF table 6.

Table 8
Greenhouse gas emissions by sector for Sweden, 1990–2015
(kt CO_2 eq)

	Energy	IPPU	Agriculture	LULUCF	Waste	Other[a]
1990	53 122.10	7 160.16	7 614.83	–36 703.17	3 739.53	–
1995	54 886.40	7 351.87	7 982.51	–32 722.22	3 555.90	–
2000	50 110.74	7 565.86	7 804.74	–37 922.44	3 216.33	–
2010	48 317.94	7 498.95	6 799.98	–48 041.40	1 937.93	–
2011	44 495.21	7 030.37	7 171.39	–41 095.30	1 858.02	–
2012	42 083.81	6 679.81	6 679.75	–46 811.74	1 719.35	–
2013	40 479.17	6 553.02	6 900.33	–44 708.02	1 604.87	–
2014	38 926.22	6 443.32	6 975.81	–45 176.28	1 490.88	–
2015	38 976.96	6 416.38	6 894.67	–50 513.03	1 402.34	–
Per cent change 1990–2015	**–26.6**	**–10.4**	**–9.5**	**37.6**	**–62.5**	**NA**

Notes: (1) Emissions/removals reported in the sector other (sector 6) are not included in total GHG emissions. (2) Sweden did not report indirect CO_2 emissions in CRF table 6.
[a] The sector other has been left blank in the CRF tables of Sweden.

Table 9

Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year[a]–2015, for Sweden
($kt CO_2 eq$)

	Article 3.7 bis as contained in the Doha Amendment[b]	*Article 3.3 of the Kyoto Protocol*		*FM and elected Article 3.4 activities of the Kyoto Protocol*				
	Land-use change	*AR*	*Deforestation*	*FM*	*CM*	*GM*	*RV*	*WDR*
FMRL				–41 336.10				
Technical correction				7 268.39				
Base year	NA				NA	NA	NA	NA
2013		–1 206.29	3 592.94	–53 243.86	NA	NA	NA	NA
2014		–1 319.00	3 157.62	–53 180.72	NA	NA	NA	NA
2015		–1 390.05	2 167.20	–52 982.04	NA	NA	NA	NA
Per cent change base year–2015					**NA**	**NA**	**NA**	**NA**

Note: Values in this table include emissions on lands subject to natural disturbances, if applicable.

[a] Sweden has not elected any activities under Article 3, paragraph 4, of the Kyoto Protocol. For activities under Article 3, paragraph 3, of the Kyoto Protocol, and FM under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] The value reported in this column refers to 1990.

2. Table 10 provides an overview of relevant key data for Sweden's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 10
Key relevant data for Sweden under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Key parameters	*Values*
Periodicity of accounting	(a) AR: commitment period accounting
	(b) Deforestation: commitment period accounting
	(c) FM: commitment period accounting
	(d) CM: not elected
	(e) GM: not elected
	(f) RV: not elected
	(g) WDR: not elected
Election of activities under Article 3, paragraph 4	None
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF and including indirect CO_2 emissions	2 521.999 kt CO_2 eq (20 175.994 kt CO_2 eq for the duration of the commitment period)
Cancellation of AAUs, ERUs, CERs and/or issuance of RMUs in the national registry for:	
1. AR in 2015	NA
2. Deforestation in 2015	NA
3. FM in 2015	NA
4. CM in 2015	NA
5. GM in 2015	NA
6. RV in 2015	NA
7. WDR in 2015	NA

Annex II

Information to be included in the compilation and accounting database

Tables 11–13 include the information to be included in the compilation and accounting database for Sweden. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) as well as the final data to be included in the compilation and accounting database.

Table 11
Information to be included in the compilation and accounting database for 2015, including on the commitment period reserve, for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
CPR	283 999 121			283 999 121
Annex A emissions for 2015				
CO_2	43 346 285			43 346 285
CH_4	4 872 359			4 872 359
N_2O	4 608 490			4 608 490
HFCs	773 106			773 106
PFCs	35 838			35 838
Unspecified mix of HFCs and PFCs	NA			NA
SF_6	54 279			54 279
NF_3	NA			NA
Total Annex A sources	**53 690 357**			**53 690 357**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015				
3.3 AR	–1 390 050			–1 390 050
3.3 Deforestation	2 167 197			2 167 197
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015				
3.4 FM	–52 982 042			–52 982 042

Table 12
Information to be included in the compilation and accounting database for 2014, for Sweden
(t CO_2 eq)

	Original submission	*Revised estimates*	*Adjustment*	*Final*
Annex A emissions for 2014				
CO_2	43 254 663			43 254 663
CH_4	4 977 027			4 977 027
N_2O	4 666 404			4 666 404
HFCs	810 591			810 591
PFCs	82 570			82 570
Unspecified mix of HFCs and PFCs	NA			NA
SF_6	44 986			44 986
NF_3	NA			NA
Total Annex A sources	**53 836 241**			**53 836 241**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014				
3.3 AR	–1 319 000			–1 319 000
3.3 Deforestation	3 157 616			3 157 616
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014				
3.4 FM	–53 180 719			–53 180 719

Table 13
Information to be included in the compilation and accounting database for 2013, for Sweden
(t CO_2 eq)

	Original submission	*Revised estimate*	*Adjustment*	*Final*
Annex A emissions for 2013				
CO_2	44 879 356			44 879 356
CH_4	5 110 731			5 110 731
N_2O	4 616 011			4 616 011
HFCs	838 548			838 548
PFCs	51 538			51 538
Unspecified mix of HFCs and PFCs	NA			NA
SF_6	41 214			41 214
NF_3	NA			NA
Total Annex A sources	**55 537 398**			**55 537 398**
Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013				
3.3 AR	–1 206 292			–1 206 292
3.3 Deforestation	3 592 936			3 592 936
FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013				
3.4 FM	–53 243 860			–53 243 860

Annex III

Additional information to support findings in table 2

Missing categories that may affect completeness

The categories for which methods are included in the 2006 IPCC Guidelines that were reported as "NE" or for which the ERT otherwise determined that there may be an issue with the completeness of reporting in the Party's inventory are the following:

(a) CO_2 emissions from the loss of living biomass and emissions/removals from mineral soil carbon for all conversions to other land (see ID# L.3 in table 3);

(b) CO_2 emissions from the use of carbonates (limestone and dolomite) (see ID# I.14 in table 5).

Annex IV

Documents and information used during the review

A. Reference documents

Reports of the Intergovernmental Panel on Climate Change

IPCC. 2003. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. J Penman, M Gytarsky, T Hiraishi, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.html.

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at http://www.ipcc-nggip.iges.or.jp/public/wetlands/.

Annual review reports

Reports on the individual reviews of the 2014, 2015 and 2016 annual submissions of Sweden, contained in documents FCCC/ARR/2014/SWE, FCCC/ARR/2015/SWE and FCCC/ARR/2016/SWE, respectively.

Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at http://unfccc.int/resource/webdocs/agi/2017.pdf.

Annual status report for Sweden for 2017. Available at http://unfccc.int/resource/docs/2017/asr/swe.pdf.

European Environment Agency. 2013. *EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013*. Available at www.eea.europa.eu/publications/emep-eea-guidebook-2013.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Frida Löfström and Mr. Johannes Morfeldt (Swedish Environmental Protection Agency), including additional material on the methodologies and assumptions used. The following documents[1] were also provided by Sweden:

Amelie Lindgren and Mattias Lundblad, 2014, *Towards new reporting of drained organic soils under the UNFCCC – assessment of emission factors and areas in Sweden, Swedish University of Agricultural Sciences, Department of Soil and Environment.*

Gustafsson et al, 2011, *SMED Report Nr. 97, Emissions from integrated iron and steel industry in Sweden.*

2017, *Branchenbuch der Kälte- und Klimatechnik.* Available at: http://www.kka-branchenbuch.de/.

Ingrid Mawdsley, 2015, *Change of activity data for lime production.* Confidential.

Katarina Yaramenka and Ingrid Mawdsley, 2015, *Correction of CO_2 emissions from Rönnskärsverken.* Confidential.

[1] Reproduced as received from the Party.